

SYEDA TAMZIDA AKTER

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RESEARCH INTEREST

- AI for Urban Mobility and Transportation Systems
- Smart Infrastructure and Disaster Resilience
- Predictive Maintenance and Structural Monitoring
- Intelligent Transportation Systems (ITS)

EDUCATION

CHITTAGONG UNIVERSITY OF ENGINEERING AND TECHNOLOGY

2020-2025

B.Sc in Civil Engineering

Thesis: Multimodal Corrosion Prediction in Reinforced Concrete Structures

Advisor: [Dr. Bipul Chandra Mondal](#), Professor, Department of CE, CUET

Average CGPA: 3.16 out of 4.00 (Last Semester: 3.50 / 4.00)

GRE and TOEFL: scheduled to take in October

TECHNICAL SKILLS

Transportation Engineering: SUMO, VISSIM, SIDRA

Geospatial Analysis: ArcGIS Pro

Programming and Statistical Analysis: Python, R-studio

Structural : Ansys, ABAQUS, ETABS, SHAP 2000

General : MS Office, Auto CAD, SKETCHUP

Libraries: Pytorch, Tensorflow, Keras, OpenCV

CONFERENCE PAPERS AND PRESENTATIONS

Optimizing V2V Communication Delay Prediction in Connected and Autonomous Vehicles through SUMO and ns-3 Simulations

Authors: [Syeda Tamzida Akter](#), [Sayed Shahriar Islam Lamun](#)

Keywords: CAVs, V2V Communication, SUMO, ns-3, Machine Learning

IEEE International Conference on Power, Electrical, Electronics and Industrial Applications (PEEIACON 2025)

Resources: [\[Paper\]](#)

CO₂ Emission Prediction at the Tigerpass Intersection Using Drone Footage, SUMO Simulation, and Interpretable Machine Learning

Authors: [Syeda Tamzida Akter](#), [Sayed Shahriar Islam Lamun](#)

Keywords: CO₂ emission prediction, SHAP, SUMO simulation, machine learning regression, drone-based traffic monitoring

7th International Conference on Electrical Information and Communication Technology (EICT 2025)

Resources: [\[Paper\]](#)

Spatio-Temporal Analysis of Accident Blackspots in Melbourne, Australia Using DBSCAN Clustering

Authors: [Syeda Tamzida Akter](#), [Sayed Shahriar Islam Lamun](#), [Kamol Debnath Dip](#)

Keywords: Spatio-temporal analysis, Accident blackspots, Road crash data, GIS, DBSCAN clustering

IEEE International Conference on Power, Electrical, Electronics and Industrial Applications (PEEIACON 2025)

Resources: [\[Paper\]](#)

Explainable Machine Learning for Understanding Trip Mode Choice: Evidence from the 2022 U.S. National Household Travel Survey

Authors: [Mahbub Hassan](#), [Syeda Tamzida Akter](#), [Sayed Shahriar Islam Lamun](#), [Touhid Bhuiyan](#), [Md Maruf Hassan](#)

Keywords: Travel Mode Choice, Public Transport, Private Transport, Machine Learning, KNN, XGBoost, Random Forest, SHAP

IEEE International Conference on Artificial Intelligence in Engineering and Technology (IICAET 2025)

Resources: [\[Paper\]](#)

Explaining Household Access to Heavy Rail Services Using Interpretable Machine Learning: Evidence from the 2022 U.S. National Household Travel Survey

Authors: [Syeda Tamzida Akter](#), [Sayed Shahriar Islam Lamun](#)

Keywords: Machine learning, Transportation planning, SHAP, Public transportation, Travel behavior

IEEE International Conference on Signal Processing, Information, Communication and Systems 2025 (SPICSCON 2025)

Resources: [\[Paper\]](#)

Analyzing Public Transit Service Patterns Using GTFS Data: A Machine Learning Approach

Authors: Mahbub Hassan, Md. Emtiaz Kabir, [Syeda Tamzida Akter](#), Urmila Bhanja, Monalisa Nayak, Debapriya Parida

Keywords: GTFS, Public transit, unsupervised learning, machine learning, sustainable transportation.

16th ICCCNT 2025: 16th International IEEE Conference on Computing Communication and Networking Technologies

Resources: [\[Paper\]](#)

Analyzing Vehicle Emissions and Mitigation Strategies in Chittagong City Using SIDRA

Authors: Farhana Mehjabin, [Syeda Tamzida Akter](#), Samia Shafique, Mahbub Hassan

Keywords: Vehicle emission, SIDRA, Roundabout, Urban Mobility

8th International Conference on Engineering Research, Innovation and Education (ICERIE 2025)

Resources: [\[Paper\]](#)

Evaluation of Concrete Strength by Using Fly Ash and Brick Kiln Ash as a Partial Replacement for Cement

Authors: [Syeda Tamzida Akter](#), Debashish Biswas, Aprita Debnath, Md. Basir Zisan

Keywords: Brick Kiln Ash, Fly Ash, Finite Element Analysis, Sustainable Material, ANSYS, Compressive Strength

8th International Conference on Engineering Research, Innovation and Education (ICERIE 2025)

Resources: [\[Paper\]](#)

UNDER REVIEW SUBMISSIONS

Artificial Intelligence-Based Solution for the Detection and Classification of Concrete Surface Deterioration

Spring 2025 – Present

Keywords: Concrete surface deterioration, YOLOV11, Object Detection, Deep learning

Status: Under review at Discover Civil Engineering

Resources: [\[Paper\]](#)

- Developed a YOLOv11-based deep learning model to automatically detect and classify six major types of concrete surface deterioration, ensuring faster and more reliable inspection than manual methods.
- Created and annotated a dataset of 6,806 concrete surface images and applied advanced augmentation techniques to enhance model robustness and generalization.
- Trained and evaluated the model using the Ultralytics YOLO framework with precision, recall, F-score, and mAP metrics, achieving high detection accuracy for real-world infrastructure monitoring.

Machine Learning in Travel Mode Choice Studies:

A Systematic Literature Review of Applications, Methods, and Challenges

Spring 2025 – Present

Keywords: Travel Mode Choice, Machine Learning, Transport Modeling, Behavior Prediction, Reinforcement Learning, Smart Mobility

Status: Under review at Result in Engineering

Resources: [\[Paper\]](#)

- To systematically review and synthesize recent applications of machine learning in travel mode choice modeling, focusing on their methodological approaches, predictive performance, and behavioral implications.
- To evaluate the strengths and limitations of machine learning techniques including feature engineering, model optimization, interpretability, and reproducibility in comparison to traditional discrete choice models.
- To identify research gaps and propose future directions aimed at enhancing behavioral realism, model transparency, and scientific rigor in travel behavior prediction.

ONGOING RESEARCH

AI-Driven EV Flow Pattern Prediction for Traffic Optimization in Washington State

Fall 2025 – Present

Keywords: Electric Vehicles (EVs), EV Flow Prediction, Battery Efficiency, Charging Networks, EV Stop Time Reduction

Status: Ongoing

- Proposes an AI-powered model to predict EV flow and optimize traffic signal timing.
- Utilizes ML algorithms and real-world data (WSDOT, charging networks, traffic volume).
- Adaptive signal control reduces EV stop times by 20% and lowers energy consumption.
- Contributes to sustainable urban mobility through improved traffic efficiency.

Hybrid Approach: Combining Finite Element Analysis (FEA) with Machine Learning for Earthquake Damage Prediction

Spring 2025 – Present

Keywords: Earthquake damage prediction, Hybrid FEA + ML, Structural response

Status: Ongoing

- Proposes a hybrid approach combining Finite Element Analysis (FEA) and Machine Learning to improve earthquake damage prediction.
- Synthetic data from FEA simulations (SAP2000) and real earthquake data are used to train ML models like XGBoost and Neural Networks.
- Physics-Informed Neural Networks (PINNs) ensure predictions respect structural laws and physical constraints.
- Enables real-time applications such as Earthquake Early Warning Systems and smart infrastructure retrofitting.

Multimodal Corrosion Prediction in Reinforced Concrete using Surface Roughness from Image ,Resistivity and Half Cell Data

Fall 2024 – Spring 2025

Keywords: Surface Roughness, Concrete Resistivity, Half-Cell Potential, Corrosion Percentage, Corrosion Percentage, Sobel Edge Detection, OpenCV, Scikit-learn, Structural Health Monitoring (SHM).

Resources: [\[Thesis Book\]](#)

- Surface Roughness Extraction: The project extracts surface roughness from concrete images using Sobel edge detection, influencing corrosion rates.
- Model Training: A Random Forest Regressor is trained on Surface Roughness, Concrete Resistivity, and Half-Cell Potential to predict corrosion percentage.
- Corrosion Prediction from Image: The model predicts corrosion percentage from a new image by extracting surface roughness and using predefined values for Surface Resistivity and Half-Cell Potential.
- Application: The model offers a non-destructive method to assess steel corrosion in concrete structures for health monitoring and predictive maintenance.

ENGINEERING PROJECTS

Assessing CAV Penetration Effects on a 2-km Expressway with SUMO: A Case Study

June 2025

- * Quantify operational impacts across CAV penetration levels (25/50/75/100%)—average speed, travel time, delay, and throughput with statistical significance testing.
- * Assess traffic stability and safety surrogates from FCD).
- * Estimate environmental effects by computing per-vehicle-km and network-total fuel and emissions (CO₂, NO_x, PM), normalized by throughput to detect diminishing returns.

Resources: [\[github\]](#)

Accident Risk Prediction in Melbourne, Australia

June 2025

- Analyzed Victoria Road Crash Dataset to identify accident patterns.
- Developed chatbot for real-time warnings on high-risk zones.).
- Provided safety insights (severity, fatalities, crash types) and personalized driving recommendations.

Resources: [\[Chatbot\]](#)

ML-Driven Chatbot for Concrete Corrosion Prediction

April 2025

- Applied ML and image processing to predict corrosion in reinforced concrete.
- Developed a software tool enabling engineers to input field data and get real-time corrosion risk predictions.).
- Supported infrastructure maintenance planning and long-term durability forecasting.

Resources: [\[Corrosion Prediction\]](#)

Structural Design of a Residential Building

May 2024

As part of our final semester course Structural Engineering & Sessional-III (CE-412), we gained valuable hands-on experience in structural design and analysis.

- Software Skills: Learned to model and analyze structures using ETABS.
- Project Work: Designed a residential building for Pink City, Chattogram, considering real-world loads, materials, and safety factors.).
- Practical Application: Applied structural engineering principles to ensure the design was both safe and efficient.
- Technical Detailing: Prepared supporting drawings and details using AutoCAD.

Resources: [\[Report-1, Report-2\]](#)

EXTRA CURRICULAR ACTIVITIES

Flood Resistant Modular House Using Autoclaved Aerated Concrete

June 2022

My team, FRAAC, was the champion of the ACI Intra-CUET Concrete Solutions Competition 2022 and represented our university globally. We also placed 11th in the global ACI Concrete Solutions Competition, proudly showcasing our work on the world stage

Resources: [\[Presentation\]](#)

Eco-concrete Solution

September 2022

In 2022, my team Concretologers earned 4th place in the ACI Intra Eco-Concrete Competition. We designed an eco-friendly concrete mix using Portland cement, silica fume and coal fly ash. Our mix achieved 30.2 years of durability, 2.54 times that of the base mix, while reducing environmental impact by 16.1%, verified with Life 365 Software.

Resources: [\[Report\]](#)

Fire Resistant Inflatable Concrete Dome House Using Concrete Canvas

April 2023

My team Mockingbird secured third place in the National Concrete Idea Competition with our innovative solution of fire-resistant inflatable concrete dome houses made from Concrete Canvas. This design addresses the critical challenges facing slum dwellers in Dhaka, including frequent fire accidents, economic instability, and the lack of durable and portable building materials.

Resources: [\[Presentation\]](#)

24h Concrete Cube Competition

March 2023

Became a finalist in the 24h Concrete Cube Competition and received the award for the most innovative mix design.

Resources: [\[Report\]](#)

Co-Founder of TWO MIN CIVIL ENGINEERING

January 2023

A YouTube channel dedicated to delivering concise, easy-to-understand explanations of civil engineering concepts, bridging the gap between theory and practice.

Resources: [\[Link\]](#)

AWARDS

- * **ACI Intra Concrete Solutions Competition 2022**, Champion
- * **ACI Concrete Solutions Competition 2022**, 11th position internationally
- * **ECO concrete 2022**, 4th in intra CUET
- * **National Concrete idea competition**, 3rd in nationwide
- * **24h Concrete Cube Competition**, Most innovative concrete mix design.

REFERENCE

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